

ASBESTOS

FACT SHEET



See related Fact Sheets: Acronyms & Abbreviations; Glossary of Terms; Cost Assumptions; Raw Water Composition; Total Plant Costs; and WaTER Program.

1. CONTAMINANT DATA

A. Chemical Data: White, gray, green or brown crystalline fibers. Asbestos consists of six different fibrous minerals (amosite, chrysotile, crocidolite, tremolite, actinolite, and anthophyllite) and occurs in natural deposits. It was introduced into our environment about 100 years ago. Asbestos fibers vary in length and may be straight or curled, they have no detectable odor or taste. Asbestos fibers are very strong, resistant to heat, corrosion, thermal effects, and most chemicals. Asbestos fibers are very stable in the environment and do not evaporate into the air or dissolve in water, considered to be non-biodegradable by aquatic organisms.

B. Source in Nature: Asbestos fibers are released into the atmosphere and water from natural sources such as erosion of asbestos-containing ores, and the wearing down of manufactured asbestos products, but the primary source of contamination is through the breakdown of asbestos-containing materials from wastewaters of factories and mining operations, and the use of asbestos laden cement pipes in water conveyance systems, also from filtering through asbestos-containing filters.

C. SDWA Limits: MCLG/MCL for asbestos is 7 million fibers per liter. (Fibers > 10 microns in length for MCLG)

D. Health Effects of Contamination: Asbestos is a known carcinogen. No Health advisories are established for short term exposures. At levels above the MCL, Asbestos has the potential to cause lung disease, Asbestosis (cancer of the lung tissue), Mesothelioma (cancer of the thin membrane surrounding the lung), and cancer to other internal organs from a lifetime exposure. Studies of people who have been exposed to Asbestos fibers in drinking water have a higher-than-average death rate from cancer of the esophagus, stomach, and intestines, but it has not been confirmed whether this is caused by asbestos alone or something else. Humidifiers could add to the hazard posed by asbestos contaminated water.

2. REMOVAL TECHNIQUES

A. USEPA BAT: Coagulation and filtration, direct filtration, or diatomaceous earth filtration.

! Coagulation and filtration uses the conventional treatment processes of chemical addition, coagulation, and dual media filtration. Benefits: low capital costs for proven, reliable process. Limitations: operator care required with chemical usage and sludge disposal.

! Direct filtration is a process for separating solid particles from the liquid in which they are suspended using chemical addition, coagulation/flocculation, and dual media filtration. Benefits: proven; reliable. Limitations: initial investment.

! Diatomaceous earth filtration uses a thin coat of diatomaceous earth over a fabric to screen out particles. Benefits: significant savings in equipment cost and required space. Limitations: Does not remove smaller particles, such as viruses. DE cost curves will be included in a future revision.

B. Alternative Methods of Treatment: Corrosion Control, reduces the amount of asbestos by changing the water chemistry to reduce the asbestos solubility. Distillation (for home drinking water only), heats water until it turns to steam. The steam travels through a condenser coil where it is cooled and returned to liquid. The asbestos remains in the boiler section. Alternately, solid block or precoated absorption filters made with carbon are certified to reduce asbestos are available.

C. Safety and Health Requirements for Treatment Processes: Personnel involved with demineralization treatment processes should be aware of the chemicals being used (MSDS information), the electrical shock hazards, and the hydraulic pressures required to operate the equipment. General industry safety, health, and self protection practices should be followed, including proper use of tools.

3. BAT PROCESS DESCRIPTION AND COST DATA

General Assumptions: Refer to: Raw Water Composition Fact Sheet for ionic concentrations; and Cost Assumptions Fact Sheet for cost index data and process assumptions. All costs are based on ENR, PPI, and BLS cost indices for March 2001. General sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal are not included.

3A. Direct Filtration:

Process - Direct filtration for asbestos uses the conventional chemical and physical treatment processes of chemical addition, rapid mix, coagulation with dry alum, flocculation, and dual media filtration. Chemical coagulation and flocculation consists of adding a chemical coagulant combined with mechanical flocculation to allow fine suspended, and some dissolved solids to clump together (floc). $\text{Al}_2(\text{SO}_4)_3$ has been proven to be the most effective coagulant for asbestos removal. Filtration provides final removal by dual media filtering of all floc and suspended solids.

Pretreatment - Jar tests to determine optimum pH for coagulation, and resulting pH adjustment, may be required.

Maintenance - A routine check of chemical feed equipment is necessary several times during each work period to prevent clogging and equipment wear, and to ensure adequate chemical supply. All pumps, valves, and piping must be regularly checked and cleaned to prevent buildup of carbonate scale, which can cause plugging and malfunction. Routine checks of contaminant buildup in the filter is required, as well as filter backwash. Recharging or clean installation of media is periodically required.

Waste Disposal - Filter backwash and spent media require approved disposal.

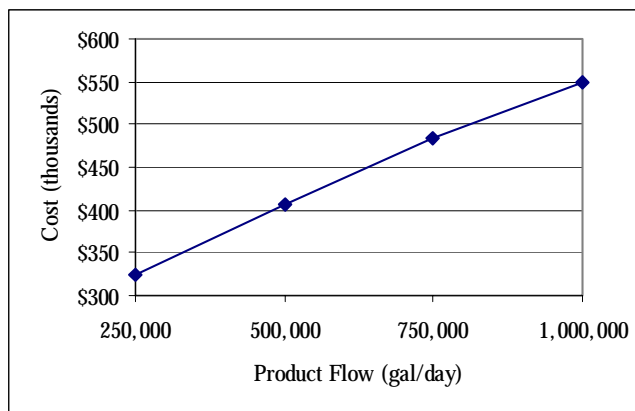
Advantages -

- ! Lowest capital costs.
- ! Lowest overall operating costs.
- ! Proven and reliable.
- ! Low pretreatment requirements.

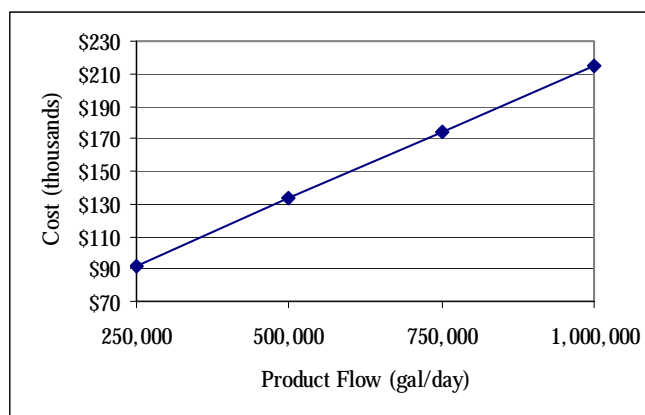
Disadvantages -

- ! Operator care required with chemical handling.
- ! Produces high sludge volume.
- ! Waters high in sulfate may cause significant interference with removal efficiencies.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal. Costs are presented for direct filtration (coagulation and filtration plus flocculation). Costs for coagulation and filtration would be less since flocculation is omitted.

3B. Coagulation and Filtration:

Process - Coagulation and filtration for insoluble Asbestos uses the conventional chemical and physical treatment processes of chemical addition, rapid mix, coagulation with dry alum, flocculation, and dual media filtration. Chemical coagulation and flocculation consists of adding a chemical coagulant combined with mechanical flocculation to allow fine suspended and some dissolved solids to clump together (floc). $\text{Al}_2(\text{SO}_4)_3$ has been proven to be the most effective coagulant for insoluble Asbestos removal. Filtration provides final removal by dual media filtering of all floc and suspended solids.

Pretreatment - Jar tests to determine optimum pH for coagulation, and resulting pH adjustment, may be required.

Maintenance - A routine check of chemical feed equipment is necessary several times during each work period to prevent clogging and equipment wear, and to ensure adequate chemical supply. All pumps, valves, and piping must be regularly checked and cleaned to prevent buildup of carbonate scale, which can cause plugging and malfunction. Routine checks of contaminant buildup in the filter is required, as well as filter backwash. Recharging or clean installation of media is periodically required.

Waste Disposal - Filter backwash and spent media require approved disposal.

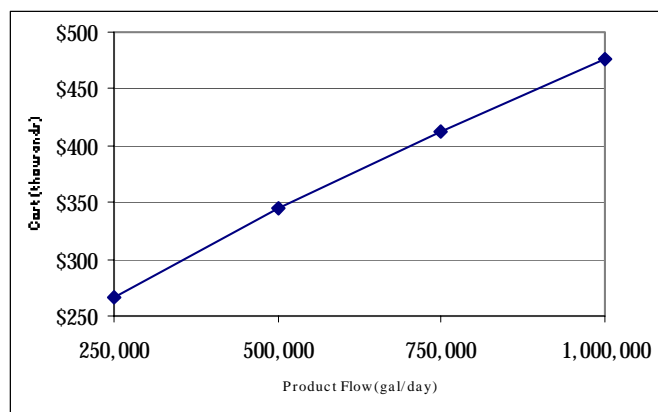
Advantages -

- ! Lowest capital costs.
- ! Lowest overall operating costs.
- ! Proven and reliable.
- ! Low pretreatment requirements.

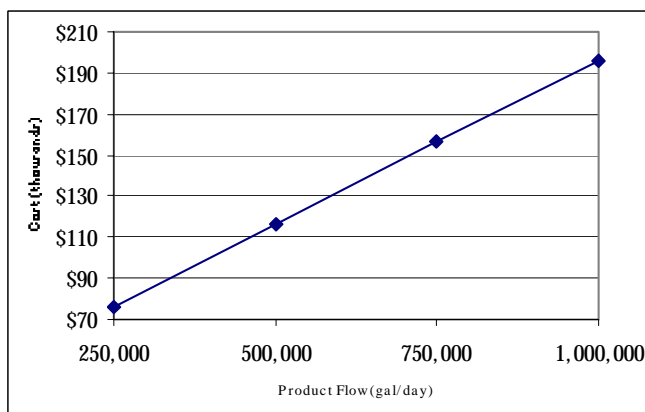
Disadvantages -

- ! Operator care required with chemical handling.
- ! Suitable only for insoluble Asbestos.
- ! Produces high sludge volume.
- ! Waters high in sulfate may cause significant interference with removal efficiencies.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal. Costs are presented for direct filtration (coagulation and flocculation plus filtration). Costs for coagulation and filtration would be less since flocculation is omitted.